

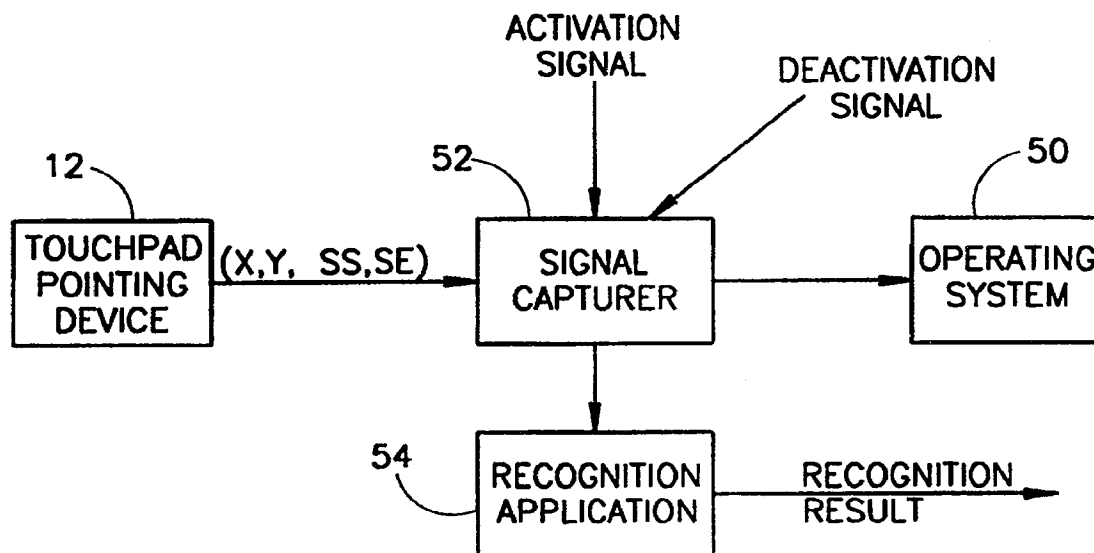


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(54) Title: A PATTERN RECOGNITION SYSTEM



## (57) Abstract

A touchpad pointing device (12, 12') utilized as a pattern input device for a pattern recognition system. The input pattern (44) received from the touchpad pointing device (12, 12') is translated into a start application command. The recognition system forms part of a computer having an operating system (50) and includes a touchpad pointing device (12, 12'), a recognition module (54) and a signal capturer (52). In addition, a unit for launching an application to run on a computer having an operating system and a pointing device (12, 12') which produces an input pattern (44) in response to movement upon it, is described. The unit includes a recognition module and a launcher. The recognition module attempts to recognize the input pattern as a previously trained launching pattern. The launcher launches the application by providing a launching command which is associated with the launching pattern to the operating device. A security application enables access to the computer upon receipt of an input signature from a user with access privileges.

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## A PATTERN RECOGNITION SYSTEM

### FIELD OF THE INVENTION

5           The present invention relates to touchpad pointing devices generally and to their use for inputting a pattern to be recognized.

### BACKGROUND OF THE INVENTION

10           Cursor pointing devices for computers are known in the art, the most common of which is a mouse. Typically, "mice" were peripheral devices kept on the side of the computer and often required a pad along which to slide. With the popularity of laptop computers and their continual reductions in size and weight, other types of mice have been produced. For example, there are mini trackballs which are located in the middle of the keyboard and which are operated through pressure.

15           Fig. 1, to which reference is now made, illustrates a laptop computer 10 with a further type of cursor pointing device 12, known as a touchpad pointing device, and two selecting buttons 14. Although not shown, touchpad pointing devices can also be implemented as external devices connectable to a laptop or desktop computer.

20           The touchpad pointing device 12 typically is a flat pad which identifies the location of a finger, labeled 16, thereon relative to the edges of the pad or to the previous position of finger 16. The touchpad pointing device 12 also includes hardware (not shown) which translates the relative position to a position on the screen. Thus, as the finger 16 sketches a curve 20 on touchpad pointing device  
25   12, a cursor 22 follows a similar curve 24 on a screen 26 of laptop computer 10.

When the user has brought cursor 22 to a desired location, such as above the word "FILE" as shown, he executes the action by either pressing one of buttons 14 or tapping on touchpad pointing device 12.

## SUMMARY OF THE PRESENT INVENTION

The present invention utilizes touchpad pointing devices as pattern input devices. This is accomplished without changing any aspect of the operation of the touchpad pointing devices themselves. Furthermore, the present invention  
5 translates the input pattern received from a touchpad pointing device into a start application command.

There is therefore provided, in accordance with a preferred embodiment of the present invention, a recognition system forming part of a computer having an operating system. The recognition system includes a  
10 touchpad pointing device, a recognition module and a signal capturer. The touchpad pointing device produces an input pattern in response to movement thereon. The recognition module receives the input pattern and attempts to recognize the input pattern. The signal capturer captures the input pattern from the touchpad pointing device and provides it to the recognition module if so  
15 activated. The input pattern can be a gesture, a letter, a signature or any other pattern.

There is also provided, in accordance with a second preferred embodiment of the present invention, a unit for launching an application to run on a computer having an operating system and a pointing device which produces an  
20 input pattern in response to movement thereon. The unit includes a recognition module and a launcher. The recognition module receives the input pattern and attempts to recognize the input pattern as a previously trained launching pattern. The launcher captures the input pattern from the pointing device, provides it to the recognition module if so activated and provides a launching command which is  
25 associated with the launching pattern to the operating device, thereby to launch an application.

There is still further provided, in accordance with a third preferred

embodiment of the present invention, a security system for a computer which includes a security application, a touchpad pointing device, a recognition module and a signal capturer. The security application enables access to the computer upon receipt of an input signature from a user with access privileges. The  
5 touchpad pointing device produces an input signature in response to movement thereon. The recognition module receives the input signature, attempts to recognize the input pattern as similar to at least one trained signature associated therewith and provides a recognition result to the security application. The signal  
10 capturer captures the input signature from the touchpad pointing device and provides it to the recognition module if so activated by the security application.

### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

5                    Fig. 1 is a schematic illustration of a prior art touchpad pointing device forming part of a laptop computer;

                  Figs. 2A and 2B are schematic illustrations of a touchpad pointing device utilized as a pattern input device, constructed and operative in accordance with a preferred embodiment of the present invention, wherein in Fig. 2A the  
10                    touchpad pointing device forms part of a laptop computer and in Fig. 2B the touchpad pointing device is an external element connected to a desktop computer;

                  Fig. 3 is a block diagram illustration of the elements of the computer system required to provide the operation shown in Figs. 2A and 2B;

15                    Fig. 4 is a schematic illustration of a translation from an input pattern to a start application command;

                  Fig. 5 is a block diagram illustration of an application launcher system, constructed and operative in accordance with a preferred embodiment of the present invention, which utilizes pattern input from a pointing device;

20                    Fig. 6 is a flow chart illustration of a recognition method, useful in the system of Fig. 4; and

                  Fig. 7 is a flow chart illustration of a training method, useful in the system of Fig. 4.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Figs. 2A and 2B which illustrate a touchpad pointing device utilized as a pattern input device, constructed and operative in accordance with a preferred embodiment of the present invention. Elements which are similar to those of Fig. 1 carry similar reference numerals. Fig. 2A shows the touchpad pointing device 12 as part of laptop computer 10 and Fig. 2B shows the touchpad pointing device, labeled 12', and buttons 14' as an external element 30 connected to a desktop computer 32 having a monitor 34 and keyboard 36. For the purposes of the present invention, both touchpad pointing devices 12 and 12' operate in the same way and, therefore, will be described together.

In accordance with a preferred embodiment of the present invention, touchpad pointing devices 12 and 12' are utilized to create patterns to be recognized. This is accomplished without changing any aspect of the operation of the touchpad pointing devices 12 and 12' themselves.

Figs. 2A and 2B show a hand 40 whose finger 42 sketches a pattern 44 on the associated touchpad pointing device 12 or 12'. Figs. 2A and 2B also show a dialog box 46 of a pattern recognition application (not shown) which displays a command 47, such as "Draw a Pattern", and the pattern 48 received thereby. Thus, in accordance with a preferred embodiment of the present invention, the movement of finger 42 inputs a pattern rather than moving the cursor as in the prior art.

The pattern recognition application can be any suitable recognition application, such as those described in U.S. Patent Applications 08/282,187, 07/978,578, 08/528,293, 08/428,806 all assigned to the common assignee of the present invention and incorporated herein by reference, which receives the input pattern 48 and translates it into a character, or set of characters, of a known

character set, such as the ASCII character set. For example, the pattern shown in Figs. 2A and 2B might be translated into the letter "W". Although not shown, it will be appreciated that multiple character patterns can also be produced on touchpad pointing devices 12 and 12'.

5           In accordance with a preferred embodiment of the present invention, devices 12 and 12' operate both as pointing devices and as pattern input devices. Typically, an activation signal must be provided to convert devices 12 and 12' from one state to the next. The activation signal can be any hot-key, such as the control key, a menu selection, a voice command or a hand-written pattern.

10           Fig. 3, to which reference is now made, illustrates the elements of the computer system, laptop, desktop, palmtop or personal digital assistant (PDA), which enable the devices 12 and 12' to operate in two modes. Fig. 3 shows the touchpad pointing device 12 and an operating system 50 to which the output of pointing device 12 is directly provided in the prior art. In accordance with a  
15           preferred embodiment of the present invention, the computer system also comprises a signal capturer 52 which acts between pointing device 12 and operating system 50, capturing the output of pointing device 12 (the (x,y) locations along the path and the start and stop indications, SS and SE respectively) as well as the activation signal. For cursor pointing device operation, signal capturer 52  
20           provides the output of pointing device 12 directly to operating system 50. However, after receipt of the activation signal, signal capturer 52 provides the output of pointing device 12 to a recognition application 54 which produces a recognition result. Signal capturer 52 will continue to do so until receiving a deactivation signal, which can be a hot-key operation, a menu operation, or the  
25           closing of the recognition application 54.

It will be appreciated that the redirection operation of signal capturer 52 can be a feature of the operating system 50. In this situation, the activation signal is provided directly to operating system 50 which then provides the input pattern

directly to the recognition application 54.

In accordance with a further preferred embodiment of the present invention, the system of Fig. 3 is operative to provide security to the computer. In this embodiment, the input pattern is the user's personal signature which he signs  
5 on the touchpad pointing device 12. After receiving an activation signal from an external application, such as a security application or a screen saver which requires a password to stop the screen saving action, the signal capturer 52 waits for input from the user and redirects the input pattern to the recognition application 54. Recognition application 54 includes therein at least one trained personal  
10 signature and attempts to match the input pattern with the trained signatures associated therewith. Recognition application 54 provides the recognition result to the application which provided the activation signal which, in turn, enables access to the computer only if the recognition result was positive.

In accordance with a second preferred embodiment of the present  
15 invention, the input pattern, received from a touchpad pointing device or from any other type of pointing device, is translated into a launch application command. Thus, a user can write a word, a gesture, or a simple character of his choosing with the pointing device and thereby launch an application. For example, the almost W-shaped pattern 48 of Figs. 2A and 2B might launch a word processing  
20 application.

Fig. 4 illustrates an exemplary set of patterns and their associated commands. For example, the handwritten W or w will cause a file called "Karen.doc" to be edited. The handwritten T causes a different file, "Trip.doc" to be edited. The handwritten C launches a calculator program and the handwritten  
25 N launches the Navigator™ browser, commercially available from Netscape Communications Corporation of California, USA.

The system to perform this is shown in Fig. 5, to which reference is

now made. In the embodiment of Fig. 5, a launching unit 56, comprising a distributor 60 and a launching manager 62, replaces signal capturer 52. Furthermore, the recognition application is a matching module 64 which provides the results of its pattern matching to launching manager 62 and the pointing device, labeled 58, can be any type of pointing device.

Distributor 60 captures the output of pointing device 58 and provides it to one or both of launching manager 62 and operating system 50. If launching manager 62 is active and if it has received the activation signal, it will provide the output of pointing device 58 to matching module 64. If no activation signal has been received, launching manager 62 will ignore the output of pointing device 58.

Matching module 64 both attempts to match the pattern from pointing device 58 to a library 66 of patterns associated therewith and accepts patterns to be placed into library 66, in an action known as "training". The library 66 comprises patterns trained by the user and an identifier for the pattern. The results of the match (either a rejection or the identifier) are provided back to launching manager 62 which converts the identifier to a "launch application" command. The identifier can either be an alphanumerical identifier or a string associated with the command. In either case, launching manager 62 provides the command associated with the pattern to operating system 50. Launching manager 62 then ignores further input patterns until it receives a further activation signal.

Figs. 6 and 7 illustrate the method performed by distributor 60, launching manager 62 and matching module 64 during recognition and pattern training, respectively. The recognition method of Fig. 6 begins by setting, in step 70, matching module 64 to the matching mode. The pattern data is then received (step 72) and provided (step 74) to matching module 64.

In step 76, launching manager 62 calls matching module 64 to perform

the recognition and to return the match results. If the match was successful, as checked in step 78, launching manager 62 determines the associated command and sends the launch application command to operating system 50.

5       The training method of Fig. 7 begins by setting, in step 84, matching module 64 to the training mode. The pattern data is then passed to matching module 64 as in the recognition method. Launching manager 62 also receives an associated command in step 86.

10       In step 88 launching manager 62 calls matching module 64 to train the pattern and to associate it with an identifier. Step 90, in which the identifier is associated with the command, can be performed by matching module 64 or by launching manager 62.

15       It will be appreciated that the system of Fig. 5 can also operate with a voice input pattern. In this embodiment, the pointing device 58 is replaced by a microphone and the matching module is a voice pattern matching module. The remaining elements operate as described hereinabove.

      It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims which follow:

## CLAIMS

1. The use of a touchpad pointing device as a pattern input device to a pattern recognizer.
2. A recognition system forming part of a computer having an operating system, the recognition system comprising:
  - a touchpad pointing device for producing an input pattern in response to movement thereon;
  - a recognition module for receiving said input pattern and for attempting to recognize said input pattern; and
  - 10 a signal capturer for capturing said input pattern from said touchpad pointing device and for providing it to said recognition module if so activated.
3. A recognition system according to claim 2 and wherein said input pattern is at least one of the following group: a gesture, a character and a signature.
- 15 4. A unit for launching an application to run on a computer having an operating system and a pointing device, the pointing device producing an input pattern in response to movement thereon, the unit comprising:
  - a recognition module for receiving said input pattern and for attempting to recognize said input pattern as a previously trained launching pattern; and

a launcher for capturing said input pattern from said pointing device, for providing it to said recognition module if so activated and for providing a launching command, associated with said launching pattern, to said operating device, thereby to launch an application.

5 5. A security system for a computer, the security system comprising:

a security application for enabling access to said computer upon receipt of an input signature from a user with access privileges;

a touchpad pointing device for producing an input signature in response to movement thereon;

10 a recognition module for receiving said input signature, for attempting to recognize said input pattern as similar to at least one trained signature associated therewith and for providing a recognition result to said security application; and

15 a signal capturer for capturing said input signature from said touchpad pointing device and for providing it to said recognition module if so activated by said security application.

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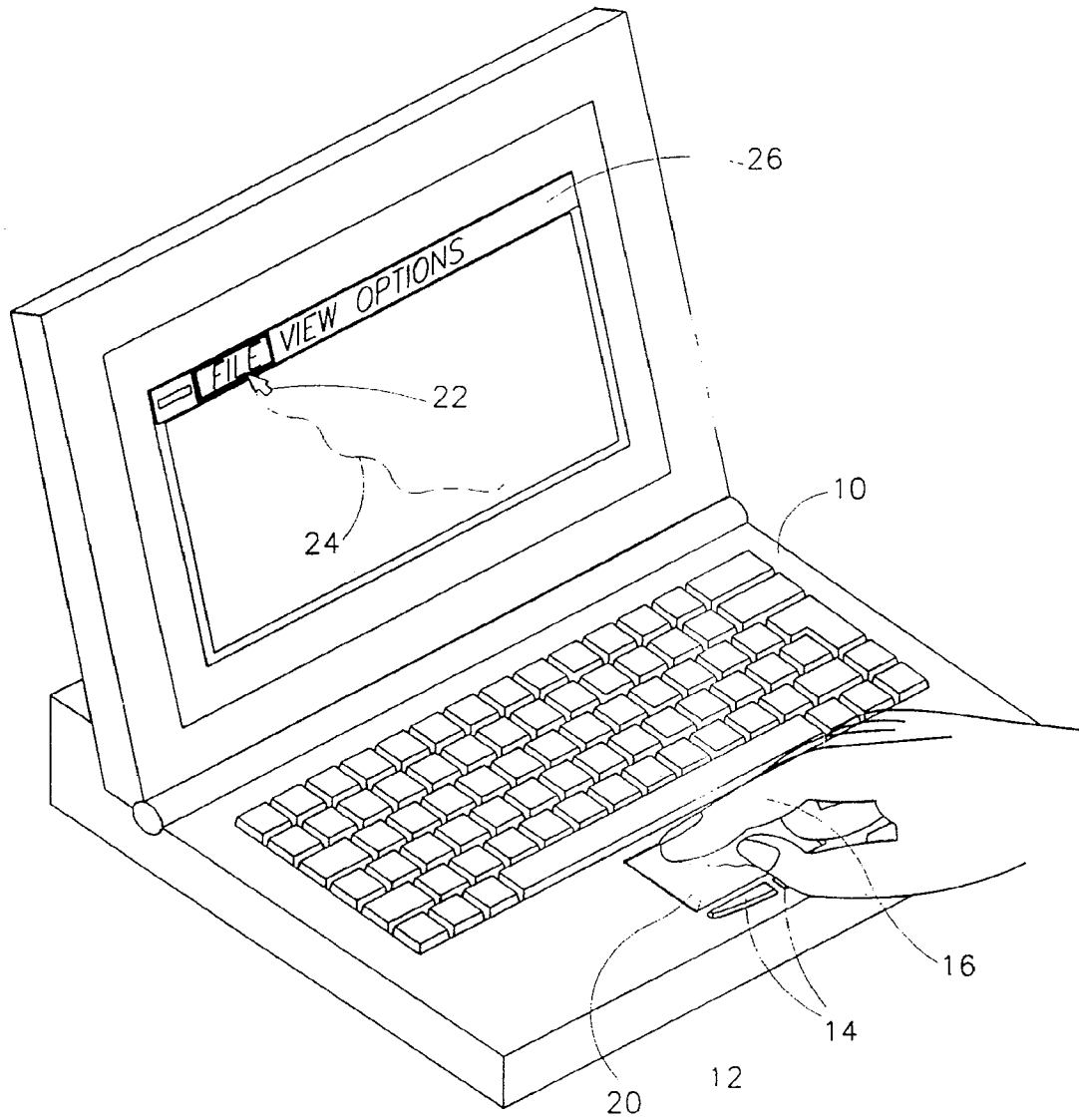


FIG.1  
PRIOR ART

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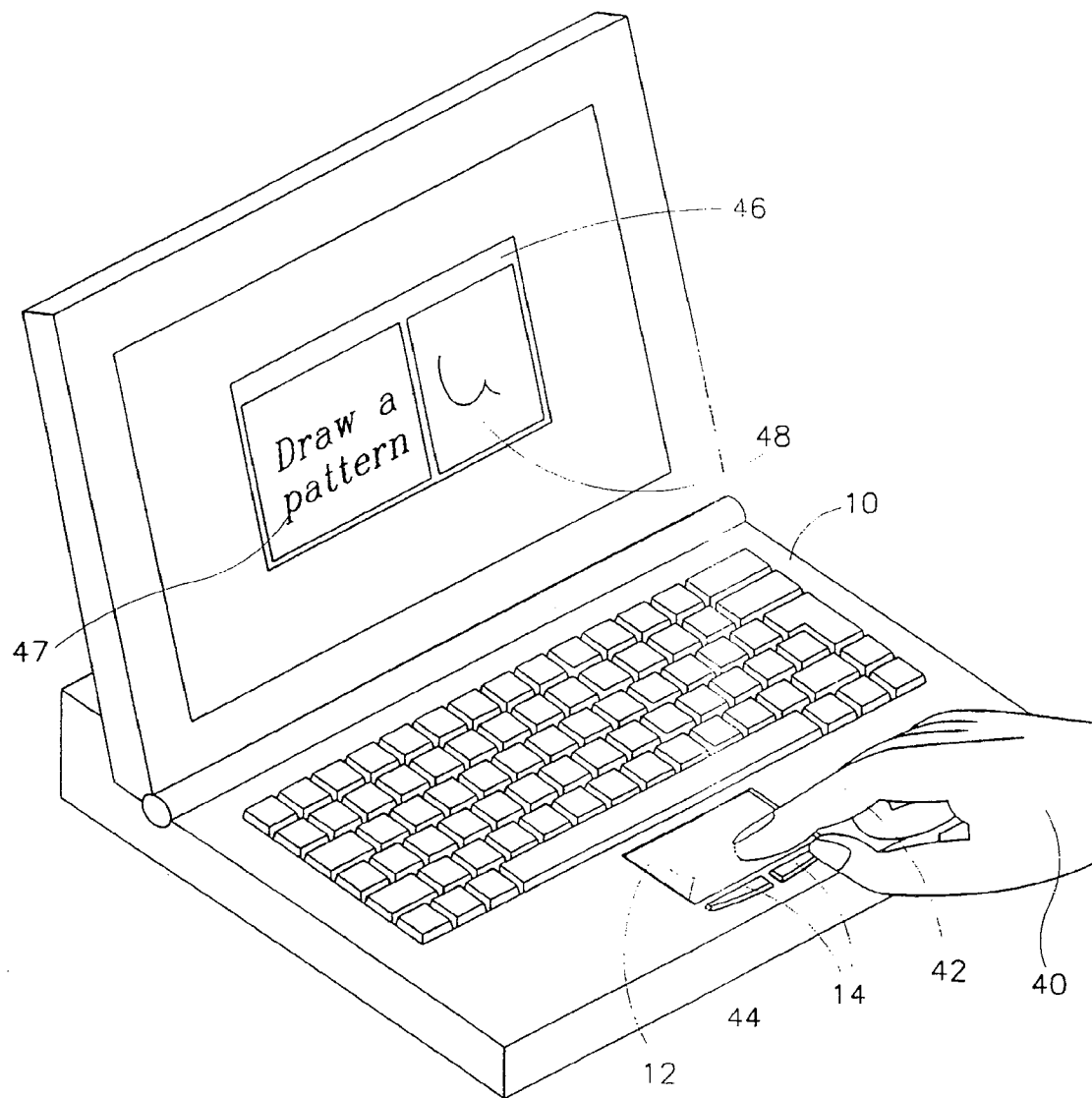


FIG. 2A

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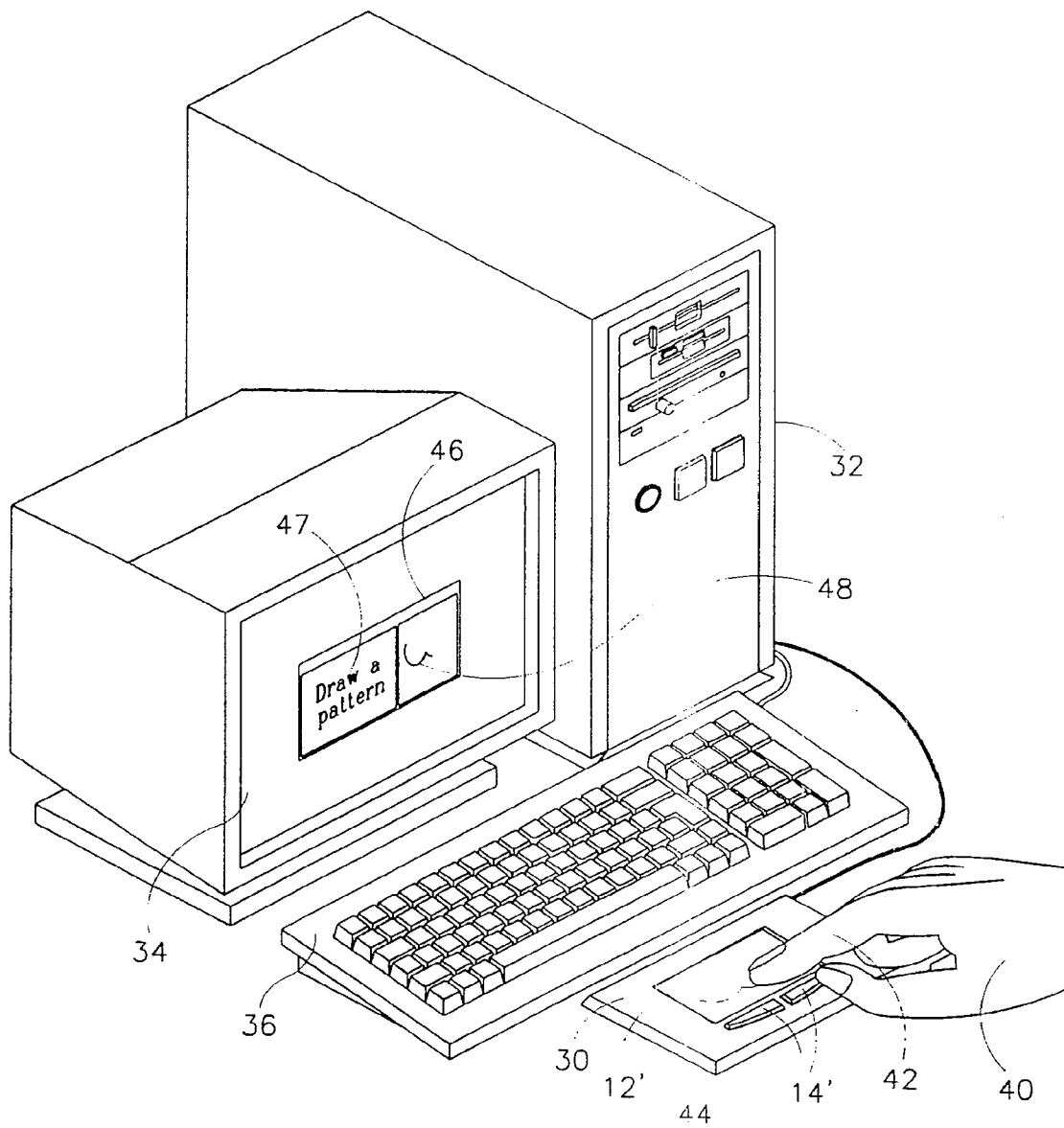


FIG. 2B

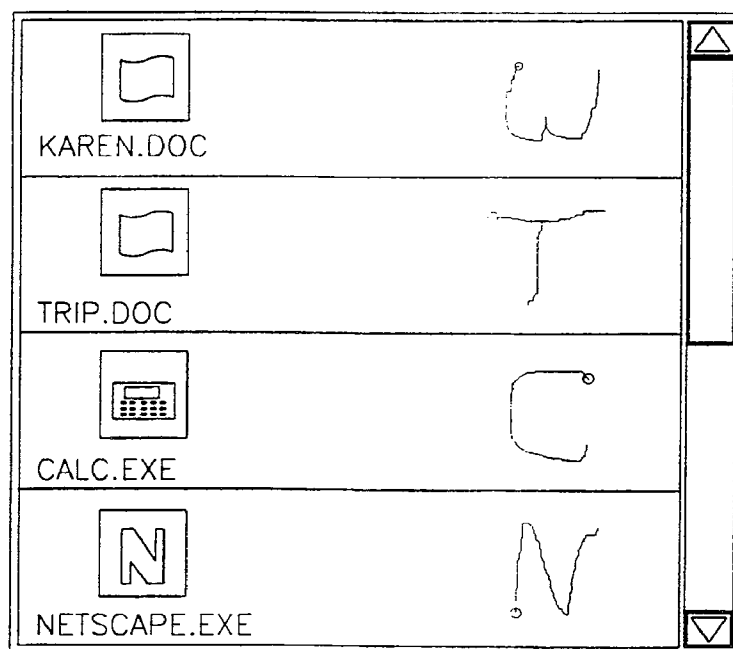
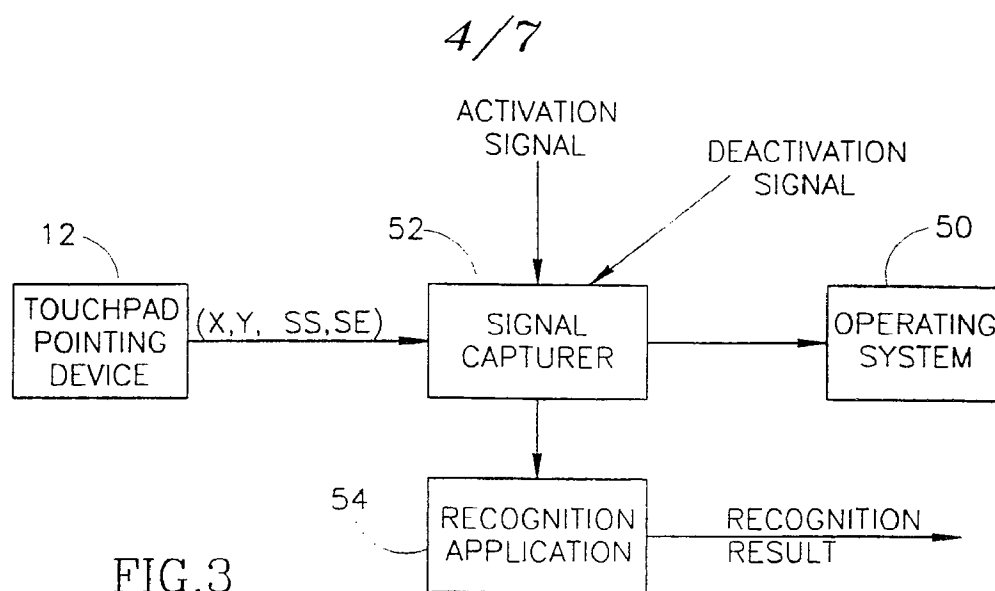


FIG.4

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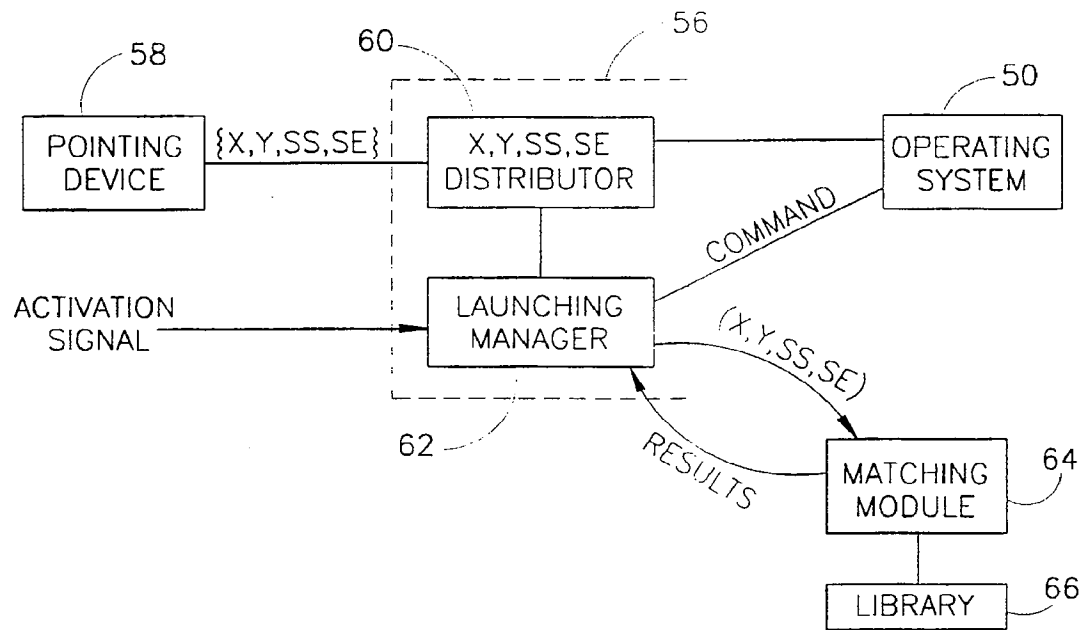


FIG.5

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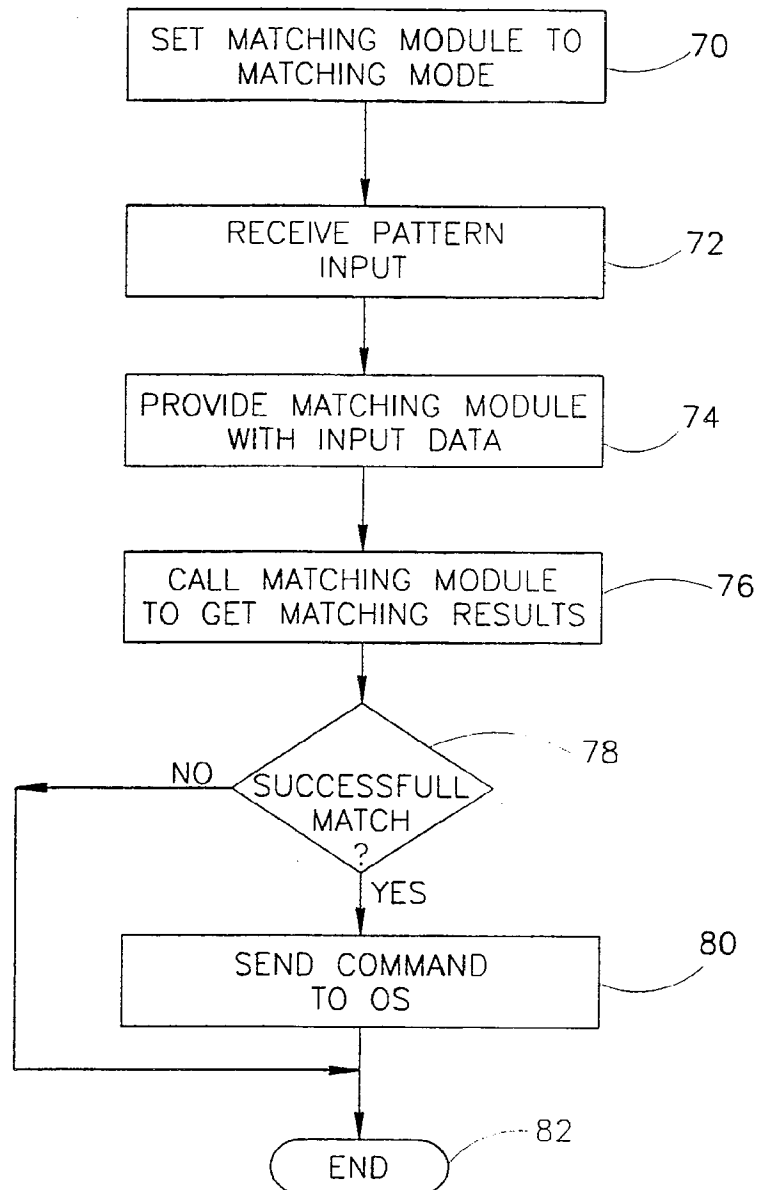


FIG.6

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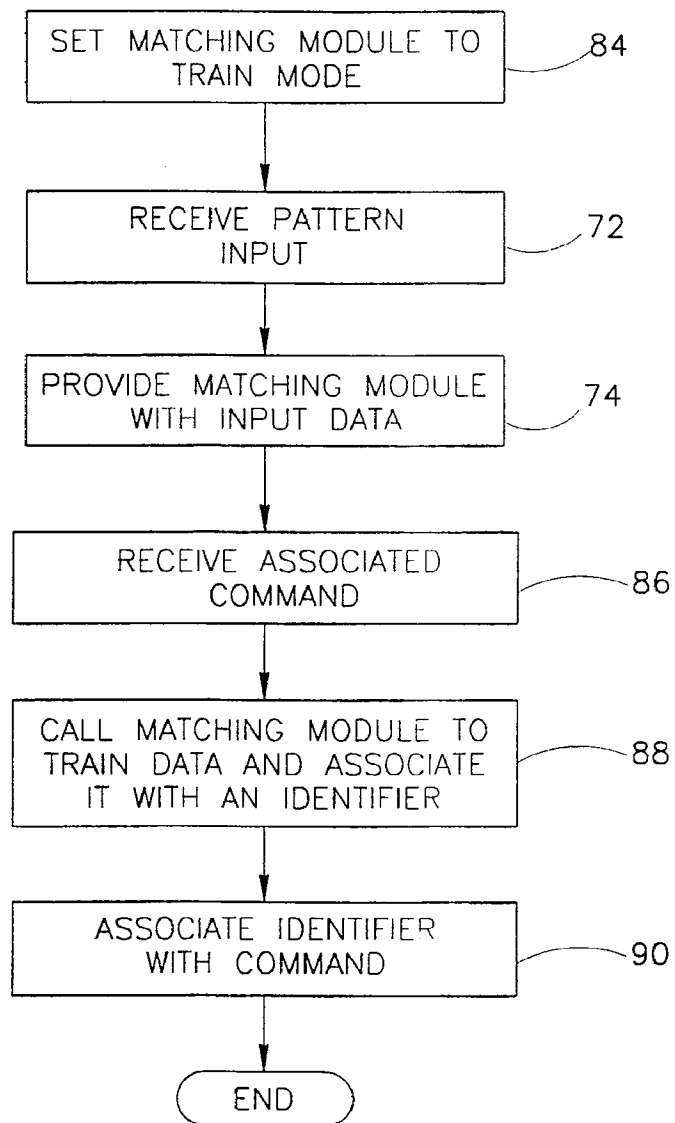


FIG.7

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IL97/00341

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G09G 5/00; G06K 9/00

US CL : 345/173, 179-183; 382/181, 187-189; 340/825.34

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/173, 179-183; 382/181, 187-189; 340/825.34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,454,046 A (CARMAN, II) 26 September 1995, Figs. 1, 2, col. 9, line 46-col. 10, line 59.	1-3
X	US 5,568,604 A (HANSEN) 22 October 1996, Fig. 2, col. 5, line 7 to col. 6, line 5.	1-4
X	EP 0 593 386 A (FITZPATRICK ET AL) 20 April 1994, Figs. 3-5	1-5



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

05 FEBRUARY 1998

Date of mailing of the international search report

11 MAR 1998

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CUSTOMER NUMBER 27792

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Steven Bathiche et al. Attorney Docket No. MICR0480

Serial No.: 10/834,675 Group Art Unit: 2673

Filed: April 29, 2004 Examiner:

Title: INTERACTION BETWEEN OBJECTS AND A VIRTUAL ENVIRONMENT DISPLAY

INFORMATION DISCLOSURE STATEMENT

Bellevue, Washington 98004

August 31, 2004

TO THE COMMISSIONER FOR PATENTS:

Applicant is aware of the information listed in the attached form that may be material to the prosecution of the above-identified patent application.

- ☒ 1. Copies of the listed non-U.S. patent publications and other information are enclosed for the Examiner's use.
- ☐ 2. Copies of the listed patents, publications, and other information were previously cited by or submitted to the U.S. Patent and Trademark Office in prior application Serial No. \_\_\_\_\_, filed \_\_\_\_\_, and relied upon for an earlier filing date under 35 U.S.C. § 120.
- ☐ 3. A concise explanation of the relevance of document I.D. No. \_\_\_\_\_ (which is not in the English language), as presently understood by the individual designated under 37 C.F.R. § 1.56(c) most knowledgeable about its content, is provided \_\_\_\_\_.
- ☒ 4. Pursuant to 37 C.F.R. § 1.97(b), this information disclosure statement is being filed within three months of the filing date of the national application, within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application, or before the mailing date of a first Office Action on the merits.
- ☐ 5. Pursuant to 37 C.F.R. § 1.97(c), this information disclosure statement is being filed after the period set forth in 37 C.F.R. § 1.97(b) but before the mailing date of either a final action under 37 C.F.R. § 1.113, or a notice of allowance under 37 C.F.R. § 1.311, and is accompanied by:
- a. \_\_\_\_\_ a certification as specified in 37 C.F.R. § 1.97(e); or
- b. \_\_\_\_\_ the fee set forth in 37 C.F.R. § 1.17(p). Check No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ is enclosed.

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6. Pursuant to 37 C.F.R. § 1.97(d), this information disclosure statement is being filed after the mailing date of either:

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X 7. Please charge any additional fees or credit any overpayment to Deposit Account No. 01-1940. A copy of this sheet is enclosed.

Respectfully submitted,



Ronald M. Anderson  
Registration No. 28,829

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Date: August 31, 2004





CUSTOMER NUMBER 27792

**INFORMATION DISCLOSURE STATEMENT LISTING SHEET**

**Information Cited By Applicant(s) That May Be Material To  
The Prosecution Of The Subject Application**

Applicants: Steven Bathiche et al. Attorney Docket No. MICR0480  
Serial-No.: 10/834,675 Group Art Unit: 2673  
Filed: April 29, 2004 Examiner:  
Title: INTERACTION BETWEEN OBJECTS AND A VIRTUAL ENVIRONMENT DISPLAY

**U.S. PATENT DOCUMENTS**

*Examiner Initial	ID	Document No.	Date	Name	Class	Sub- Class
_____	US1	4,992,650	02/12/1991	Somerville	235	462

**FOREIGN PATENT DOCUMENTS**

*NONE CITED*

**OTHER INFORMATION**

*Examiner Initial	Document No.	Document Information
_____	O1	"3.6 Interpolation in Two or More Dimensions." Numerical Recipes in C: The Art of Scientific Computing. Chapter 3. Interpolation and Extrapolation. © 1988-1992, Cambridge University Press. Numerical Recipes Software. pp. 123-128.
_____	O2	"Bar Code 1, 2-Dimensional Bar Code Page." Available <a href="http://www.adams1.com/pub/russadam/stack.html">http://www.adams1.com/pub/russadam/stack.html</a> . Printed 01/20/2004. 14pp.
_____	O3	Ambiente article. "InteracTable®." Dated 07-Jul-2k. Available <a href="http://www.darmstadt.gmd.de/ambiente/activities/interactable.html">http://www.darmstadt.gmd.de/ambiente/activities/interactable.html</a> . Printed 11/21/2003. 3pp.
_____	O4	Bier, Stone, Pier, Buston, and DeRose. "Toolglass and Magic Lenses: The See-Through Interface." <i>Proceedings of Siggraph '93</i> (Anaheim, August). <i>Computer Graphics Annual Conference Series</i> , ACM, 1993, pages 73-80. 8pp.
_____	O5	Blickenstorfer, Conrad H. "First Look: Acer TravelMate TM100 with Windows XP Tablet PC Edition." <i>Pen Computing Magazine</i> . July 2002. pp. 44-47.
_____	O6	"DiamondSpin - Begg for Direct Manipulation Technology Is it the Pen? Sony Leaps Out-of-the-Box Again with Gummi." <i>Mitsubishi/DiamondSpin</i> . CHI 2004 #3. Printed 4/30/2004. 5pp.
_____	O7	Dietz and Leigh. "DiamondTouch: A Multi-User Touch Technology." <i>UIST '01 Orlando FLA</i> . © ACM 2001 1-58113-438 -x/01/11. CHI Letters 3 (2). November 11-14, 2001. pp. 219-226.
_____	O8	Electronic Check Alliance Processing, Inc. "Gift Cards, How Stored Value Card Systems Work." Available. <a href="http://www.electron-cap.com/GiftCards.htm">http://www.electron-cap.com/GiftCards.htm</a> . Printed 1/20/2004 and 05/16/2004. ©2003. 2pp. total (3pp printed).

## OTHER INFORMATION

<u>*Examiner Initial</u>	<u>Document No.</u>	<u>Document Information</u>
_____	O9	Fukuchi and Rekimoto. "Interaction Techniques for SmartSkin." <i>ACM UIST2002 demonstration</i> , 2002. 2pp.
_____	O10	Grabowski, Robert. "A Miniature Video Laser Range Finder for Small Robots." Available <a href="http://www.andrew.cmu.edu/~rjg/research/research_hardware/laser_rangefinder.html">http://www.andrew.cmu.edu/~rjg/research/research_hardware/laser_rangefinder.html</a> . Printed 5/16/2004. 8pp.
_____	O11	Grant and Winograd. "Flexible, Collaborative Organization on a Tabletop." <i>ACM CSCW 2002: Workshop on Co-located Tabletop Collaboration: Technologies and Directions</i> . New Orleans, LA. November 2002. pp. 1-4.
_____	O12	Horn, Berthold K. P. "Robot Vision." The MIT Press. Available <a href="http://mitpress.mit.edu/catalog/item/default.asp?tttype=2&amp;tid=8388">http://mitpress.mit.edu/catalog/item/default.asp?tttype=2&amp;tid=8388</a> . Printed 12/17/2003. 6pp. total.
_____	O13	Horn, Berthold Klaus Paul. "Robot Vision." Binary Images: Topological Properties. The MIT Electrical Engineering and Computer Science Series. 1986. pp. 66-71 and cover page(s).
_____	O14	Hunter, Andrew. "Connected Components Analysis (Computer Vision)." <a href="http://www.google.com">www.google.com</a> search results <a href="http://www.google.com/search?sourceid=navclient&amp;q=connected+component+ellipse">http://www.google.com/search?sourceid=navclient&amp;q=connected+component+ellipse</a> . Printed 3/7/2004. Article dated 09/24/2002. 2pp search results, 21pp article.
_____	O15	"IR Distance Sensor." Available <a href="http://www.diyelectronics.com/Accessories/IRDS.html">http://www.diyelectronics.com/Accessories/IRDS.html</a> (2pp) and <a href="http://www.diyelectronics.com/Accessories/GP2D05.html">http://www.diyelectronics.com/Accessories/GP2D05.html</a> (1pg). Printed 12/30/2003. 3pp.
_____	O16	Ishii and Ullmer. "Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms." <i>Proceedings of CHI '97</i> , March 22-27, 1997, Atlanta, Georgia. © 1997 ACM 0-89791-802-9/97/03. pp. 1-8.
_____	O17	Ishii, Wisneski, Orbanes, Chun, and Paradiso. "PingPongPlus: Design of an Athletic-Tangible Interface for Computer-Supported Cooperative Play." <i>Proceeding of CHI '99</i> , May 15-20, 1999, © 1999 ACM. pp. 1-8.
_____	O18	Johanson, Kolodny, and Russell. "A Hand pose and Position Tracker for the Interactive Table." CS223B Final Project. Available <a href="http://graphics.stanford.edu/~drussel/vision/tracker-report.html">http://graphics.stanford.edu/~drussel/vision/tracker-report.html</a> . Printed 12/16/2003, 6pp.
_____	O19	Ju, Hurwitz, Judd, and Lee. "CounterActive: An Interactive Cookbook for the Kitchen Counter." <i>Extended Abstracts of CHI 2001</i> , Seattle. April 2001. pp. 269-270.
_____	O20	Kang, Sing Bing. "Radial Distortion Snakes." <i>IAPR Workshop on Machine Vision Applications (MVA2000)</i> , Tokyo, Japan. November 2000. pp. 603-606.
_____	O21	Kato, Billinghurst, Poupyrev, Imamoto, and Tachibana. "Virtual Object Manipulation on a Table-Top AR Environment." <i>IEEE and ACM Int'l Symposium on Augmented Reality 2000, ISAR'2000, October 5-6, 2000, Munich</i> . 9pp.
_____	O22	Klemmer, Newman, and Sapien. "The Designer's Outpost: A Task-Centered Tangible Interface for Web Site Information Design." <i>Proceedings of Human Factors in Computing Systems: CHI 2000 Extended Abstracts</i> . The Hague, The Netherlands. April 1-6, 2000. pp. 333-334.
_____	O23	Klemmer, Newman, Farrell, Bilezikjian, and Landay. "The Designers' Outpost: A Tangible Interface for Collaborative Web Site Design." <i>CHI Letters, The 14<sup>th</sup> Annual ACM Symposium on User Interface Soft Technology: UIST 2001</i> . 3(2). pp. 1-10.
_____	O24	Kobayashi, Hirano, Narita, and Ishii. "A Tangible Interface for IP Network Simulation." <i>CHI 2003</i> , April 5-10, 2003, Ft. Lauderdale, FL ACM 1-58113-630-7/03/0004. 2pp.
_____	O25	Koike, Sato, and Kobayashi. "Integrating Paper and Digital Information on EnhancedDesk: A Method for Realtime Finger Tracking on an Augmented Desk System." <i>ACM Transaction on Computer-Human Interaction</i> , Vol. 8 No. 4, December 2001. © 2001 ACM 1073-0516/01/1200-0307. pp. 307-322.

## OTHER INFORMATION

<u>*Examiner Initial</u>	<u>Document No.</u>	<u>Document Information</u>
_____	O26	Leibe, Starnier, Ribarsky, Wartell, Krum, Singletary, and Hodges. "The Perceptive workbench: Toward Spontaneous and Natural Interaction In Semi-Immersive Virtual Environments." <i>Proceedings of the IEEE Virtual Reality 2000 Conference</i> , March 18-22, 2000. New Brunswick, New Jersey: IEEE Computer Society, 2000. 8pp.
_____	O27	Leigh and Dietz. "DiamondTouch Characteristics and Capabilities." Mitsubishi Electric Research Laboratories, Cambridge, Massachusetts, USA. Undated. 2pp.
_____	O28	Magerkurth, Stenzel, and Prante. "STARS - A Ubiquitous Computing Platform for Computer Augmented Tabletop Games." <i>5<sup>th</sup> International Conference on Ubiquitous Computing (UbiComp '03)</i> , October 12-15, 2003, Seattle, Washington. 2pp.
_____	O29	Malandain, Grégoire. "Connected Components Extraction." Available <a href="http://www-sop.inria.fr/epidaure/personnel/malandain/segment/connexe.html">http://www-sop.inria.fr/epidaure/personnel/malandain/segment/connexe.html</a> . Printed 12/18/2003. 3pp.
_____	O30	Matsushita and Rekimoto. "HoloWall: Designing a Finger, Hand, Body, and Object Sensitive Wall." <i>UIST '97 Banff</i> , Alberta, Canada. © 1997 ACM 0-89791-881-9/97/10. pp. 209-210.
_____	O31	Missouri Department Of Revenue. "2D Barcode Technology." Undated. 3pp.
_____	O32	Moran, Saund, van Melle, Gujar, Fishkin, and Harrison. "Design and Technology for Collaborative; Collaborative Collages of Information on Physical Walls." <i>UIST '99</i> . Asheville, NC. © 1999 ACM 1-58113-075-9/99/11, CHI Letters vol 1, 1. pp. 197-206.
_____	O33	Pangaro, Maynes-Aminzade, and Ishii. "The Actuated Workbench: Computer-Controlled Actuation in Tabletop Tangible Interfaces." <i>Proceedings of UIST 2002</i> , October 27-30, 2002. © 2002 ACM. 10pp.
_____	O34	Paradiso, Hsiao, Strickon, Lifton, and Adler. "Sensor systems for interactive surfaces." <i>IBM Systems Journal</i> , Vol. 39, Nos. 3&4, 2000. pp. 892-914.
_____	O35	Patten, Ishii, Hines, and Pangaro. "Senseable: A Wireless Object Tracking Platform for Tangible User Interfaces." <i>Proceedings of CHI 2001</i> , March 31-April 5, 2001, ACM Press, © 2001 ACM. 8pp.
_____	O36	Patten, Recht, and Ishii. "Audiopad: A Tag-based Interface for Musical Performance." <i>Proceedings of Conference on New Interface for Musical Expression (NIME '02)</i> . Dublin, Ireland, May 24-26, 2002. 6pp.
_____	O37	Ramos and Balakrishnan. "Fluid Interaction Techniques for the Control and Annotation of Digital Video." <i>UIST '03 Vancouver</i> , B.C., Canada. © 2003 ACM 1-58113-636-06/03/0010. pp. 105-114.
_____	O38	Rekimoto and Ayatsuka. "CyberCode: Designing Augmented Reality Environments with Visual Tags." <i>Proc. of UIST 2000</i> , 2000. 10pp.
_____	O39	Rekimoto and Matsushita. "Perceptual Surfaces: Towards a Human and Object Sensitive Interactive Display." <i>Proceedings of Workshop on Perceptual User Interacts (PUI'97)</i> , 1997. 3pp.
_____	O40	Rekimoto and Nagao. "The World through the Computer: Computer Augmented Interaction with Real World Environments." <i>Proceedings of UIST'95</i> , 1995. pp. 29-36.
_____	O41	Rekimoto and Saitoh. "Augmented Surfaces: A Spatially Continuous Work Space for Hybrid Computing Environments." <i>CHI '99</i> , 15-20 May 1999. Pittsburgh, Pennsylvania. © ACM 1999 0-201-48559-1/99/05. pp. 378-385.
_____	O42	Rekimoto, Jun. "Matrix: A Realtime Object Identification and Registration Method for Augmented Reality." <i>Proc. of Asia Pacific Computer Human Interaction (APCHI '98)</i> , 1998. 6pp.
_____	O43	Rekimoto, Jun. "Multiple-Computer User Interfaces: 'Beyond the Desktop' Direct Manipulation Environments." <i>ACI CHI2000 Video Proceedings</i> , 2000. 2pp.
_____	O44	Rekimoto, Jun. "Pick-and-Drop: A Direct Manipulation Technique for Multiple Computer Environments." <i>Proceedings of UIST'97</i> , 1997. pp. 31-39.

## OTHER INFORMATION

<u>*Examiner Initial</u>	<u>Document No.</u>	<u>Document Information</u>
_____	O45	Rekimoto, Jun. "SmartSkin: An Infrastructure for Freehand Manipulation on Interactive Surfaces." <i>CHI 2002</i> , April 20-25, 2002, Minneapolis, Minnesota. © 2001 ACM 1-58113-453-3/02/0004. 8pp.
_____	O46	Rekimoto, Ullmer, and Oba. "DataTiles: A Modular Platform for Mixed Physical and Graphical Interactions." <i>SIGCHI'01</i> , March 31-April 4, 2001, Seattle, WA. © 2001 ACM 1-58113-327-8/01/0003. 8pp.
_____	O47	Reznik, Canny, and Alldrin. "Leaving on a Plane Jet." <i>2001 Int. Conf. on Intell. Robots &amp; Systems (IROS)</i> , Maui, Hawaii, October 2001. 6pp.
_____	O48	Ringel, Gerh, Jin, and Winograd. "Barehands: Implement-Free Interaction with a Wall-Mounted Display." <i>Short Talks. CHI 2001</i> 31 March - 5 April. Pp. 367-368.
_____	O49	Rosenfeld, Zawadzki, Sudol, and Perlin. "Planar Manipulator Display." New York University mrl. NYU Media Research Lab. Available <a href="http://cat.nyu.edu/PMD">http://cat.nyu.edu/PMD</a> . Printed 5/16/2004. 3pp.
_____	O50	Rovani, David (Posted by). "My Second Month with the Compaq Tablet." <i>Home&gt;Reviews, TablePCHome.com - Table PC user community</i> . Posted 4/10/2003. Available <a href="http://www.tabletpchome.com/Messages.aspx?ThreadID=140">http://www.tabletpchome.com/Messages.aspx?ThreadID=140</a> . Printed 12/30/2003. pp. 1-2 of 5.
_____	O51	Schmalstieg, Encarnação, and Szalavári. "Using Transparent Props for Interaction With The Virtual Table." Presented at <i>1999 ACM Symposium on Interactive 3D Graphics (I3DG '99)</i> . April 26-28, 1999, Atlanta, GA. 7pp.
_____	O52	Scott, Grant, and Mandryk. "System Guidelines for Co-located collaborative Work on a Tabletop Display." <i>Proceedings of ECSCW'03, European Conference Computer-Supported Cooperative Work 2003</i> , Helsinki, Finland, September 14-18, 2003. 20pp.
_____	O53	Shen, Everitt, and Ryall. "UbiTable: Impromptu Face-to-Face Collaboration on Horizontal Interactive Surfaces." © Mitsubishi Electric Research Laboratories, Inc., 2003. Cambridge, Massachusetts. TR-2003-49. September 2003. 10pp.
_____	O54	Shen, Lesh, and Vernier. "Personal Digital Historian: Story Sharing Around the Table." <i>Interactions</i> . March + April 2003. pp. 15-22.
_____	O55	Shen, Lesh, Bernier, Forlines, and Frost. "Sharing and Building Digital Group Histories." <i>CSCW'02</i> , November 16-20, 2002, New Orleans, Louisiana. © 2002 ACM 1-58113-560-2/02/0011. 10pp.
_____	O56	Shen, Lesh, Moghaddam, Beardsley, and Bardsley. "Personal Digital Historian: User Interface Design." © Mitsubishi Electric Research Laboratories, Inc. 2001. Cambridge, Massachusetts. 5pp.
_____	O57	Shen, Vernier, Forline, and Ringel. "DiamondSpin: An Extensible Toolkit for Around-the-Table Interaction." <i>CHI 2004</i> , April 24-29, 2004, Vienna, Austria. © 2004 ACM 1-58113-702-8/04/0004. 8pp.
_____	O58	SMART Technologies Inc. White Paper. "DViT Digital Vision Touch Technology." February 2003. 10pp.
_____	O59	Smart Technologies, Inc. "Rear Projection SMART Board™ Interactive Whiteboard" "SMART Board Software". Available <a href="http://www.smarttech.com/Products/rearprojection/index.asp">http://www.smarttech.com/Products/rearprojection/index.asp</a> and <a href="http://www.smarttech.com/Products/sbsoftware/index.asp">http://www.smarttech.com/Products/sbsoftware/index.asp</a> . Printed 12/16/2003. 5pp. total.
_____	O60	Starnier, Leibe, Singletary, Lyons, Gandy, and Pair. "Towards Augmented Reality Gaming." Available <a href="http://www.gvu.gatech.edu/ccg/publications/imagina2000/">http://www.gvu.gatech.edu/ccg/publications/imagina2000/</a> . Printed 12/30/2003. 27pp.
_____	O61	Streitz, Geißler, Holmer, Konomi, Müller-Tomfelde, Reischl, Rexrogh, Seitz, and Steinmetz. "i-LAND: An interactive Landscape for Creativity and Innovation." <i>Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI'99)</i> , Pittsburgh, Pennsylvania, May 15.-20, 1999. ACM Press, New York. Pp. 120-127.
_____	O62	Symanzik, Jürgen. "Three-Dimensional Statistical Graphics Based On Interactively Animated Anaglyphs." Published 1993. Available <a href="http://citeseer.mj.nec.com/95667.html">http://citeseer.mj.nec.com/95667.html</a> . Printed 2/25/2004. 7pp. total.

## OTHER INFORMATION

<u>*Examiner Initial</u>	<u>Document No.</u>	<u>Document Information</u>
_____	O63	"The Tablet PC: A detailed look at Microsoft's proposed Tablet PC." <i>Pen Computing Magazine: Tablet PC</i> . Available <a href="http://www.pencomputing.com/frames/textblock_tablet_pc.html">http://www.pencomputing.com/frames/textblock_tablet_pc.html</a> . Printed 12/30/2003. pp. 1
_____	O64	Tandler, Prante, Müller-Tomfelde, Streitz, and Steinmetz. "ConnecTables: Dynamic Coupling of Displays for the Flexible Creation of Shared Workspaces." <i>Proceedings of the 14. Annual ACM Symposium on User Interface Software and Technoic (USIT'01)</i> , ACM Press (CHI Letters 3 (2)), 2001, pp. 11-20 (10pp).
_____	O65	Ullmer and Ishii. "The metaDESK: Models and Prototypes for Tangible User Interfaces." <i>Proceedings of UIST'97</i> , October 14-17, 1997. © 1997 ACM - ACM 0-89791-881-9/97/10. 10pp.
_____	O66	Ullmer, Ishii, and Glas. "mediaBlocks: Physical Containers, Transports, and Controls for Online Media." <i>Computer Graphics Proceedings (SIGGRAPH'98)</i> , July 19-24, 1998, © 1998 ACM. ACM-0-89791-999-8-8/98/007. 8pp.
_____	O67	Ullmer, Ishii, and Jacob. "Tangible query Interfaces: Physically Constrained Tokens for Manipulating Database Queries." <i>Proc. INTERACT 2003 Conference</i> , 2003. 11pp.
_____	O68	Underkoffler and Ishii. "Illuminating Light: An Optical Design Tool with a Luminous-Tangible Interface." <i>Proceeding of CHI '98</i> , April 18-23, 1998, © 1998 ACM. pp. 1-8.
_____	O69	Underkoffler and Ishii. "Urp: A Luminous-Tangible Workbench for Urban Planning and Design." <i>Proceedings of CHI '99</i> . May 15-20, 1999. © 1998 ACM. pp. 1-8.
_____	O70	Underkoffler, Ullmer, and Ishii. "Emancipated Pixels: Real-World Graphics in the Luminous Room." <i>Proceedings of SIGGRAPH '99</i> , August 8-13, 1999, © 1999 ACM. 8pp.
_____	O71	Vernier, Lesh, and Shen. "Visualization Techniques for Circular Tabletop Interfaces." To appear in <i>Advanced Visual Interfaces</i> , May 2002, Trento, Italy. © 2002 Mitsubishi Electric Research Laboratories, Inc. MERL-TR2002-01. Authored March 2002. 10pp.
_____	O72	Viola and Jones. "Robust Real-time Object Detection." Cambridge Research Laboratory, Technical Report Series. Compaq. CRL 2001/01, February 2001. 30pp.
_____	O73	"VIRTUALBOARD." Available <a href="http://visilab.unime.it/visilab/virtualboard.htm">http://visilab.unime.it/visilab/virtualboard.htm</a> . Printed 12/16/2003. 6pp.
_____	O74	Von Hardenberg and Bérard. "Bare-Hand Human-Computer Interaction." <i>PUI 2001</i> Orlando, FL, ©2001 ACM 1-58113-448-7-11/14/01. 8pp.
_____	O75	Wellner, Pierre. "Interacting with Paper on the DigitalDesk." <i>Communications of the ACM</i> . July 1993. EuroPARC tech report EPC-93-195. 17pp.
_____	O76	Whalen, Tara. "Playing well with Others: Applying Board Game Design to Tabletop Display Interfaces." <i>UIST 2003</i> . Vancouver, November 2-5, 2003, 3pp.
_____	O77	Wu and Balakrishnan. "Multi-Finger and Whole Hand Gestural Interaction Techniques for Multi-User Tabletop Displays." <i>UIST '03</i> , Vancouver, B.C., Canada. © 2003 ACM 1-58113-636-6/03/0010. pp. 193-202.

Examiner's Signature

Date

\*Examiner: Initial if reference considered, whether or not citation is in conformance with M.P.E.P. § 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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